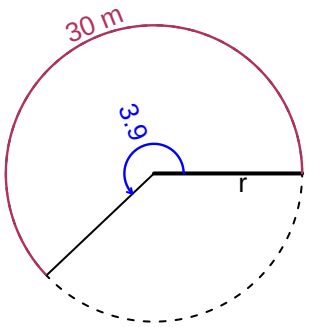
Name: Date:

Trig Final (SLTN v611)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 30 meters. The angle measure is 3.9 radians. How long is the radius in meters?

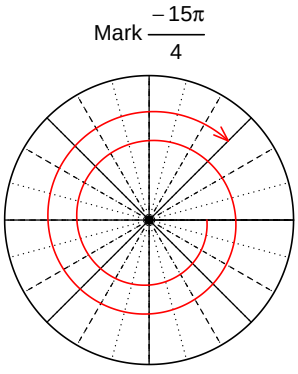


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

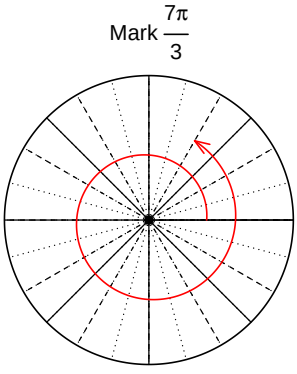
$r = 7.692$ meters.

Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{7\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-15\pi}{4}\right)$ and $\cos\left(\frac{7\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(-15\pi/4)$



Find $\cos(7\pi/3)$

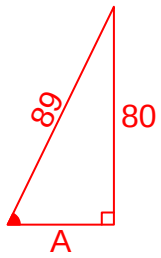
$\sin(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(7\pi/3) = \frac{1}{2}$

Question 3

If $\sin(\theta) = \frac{80}{89}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

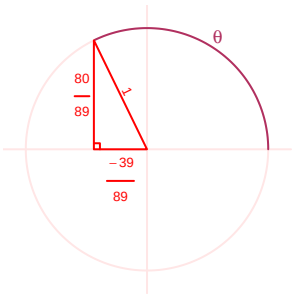
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 80^2 = 89^2$$
$$A = \sqrt{89^2 - 80^2}$$
$$A = 39$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-39}{89}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 4.94 Hz, a midline at $y = -3.01$ meters, and an amplitude of 7.69 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -7.69\sin(2\pi 4.94t) - 3.01$$

or

$$y = -7.69\sin(9.88\pi t) - 3.01$$

or

$$y = -7.69\sin(31.04t) - 3.01$$